LIFE CYCLE COST METHODOLOGY

2005 California Building Energy Efficiency Standards

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Overview

The Energy Commission is required by law to develop and maintain energy efficiency standards that are ". . . *cost effective, when taken in their entirety, and when amortized over the economic life of the structure when compared with historic practice*".[1] This document describes the life cycle cost (LCC) methodology to be used to justify proposed standards changes for the 2005 Update. There are two methods that may be used:

Annual LCC Method   Previous energy efficiency standards[2] have been shown to be cost effective using an *Annual LCC Method.* With this method, energy savings are estimated on an annual basis. The net present value (NPV) of the savings is calculated by multiplying the annual savings by the present value of a unit of saved energy.

Hourly LCC Method   Time Dependent Valuation (TDV) is a recommended standards change for the 2005 standards. Using TDV requires a more advanced approach to LCC that may be used as an option. With the more advanced TDV approach, it is necessary to estimate energy savings on an hourly basis. The energy savings for each hour are multiplied times the NPV of energy for that hour.

The annual LCC method may be used for all measures. If a measure can be shown to be cost effective using the annual LCC method, this is sufficient. However, the benefit of some measures may be enhanced if the hourly LCC method is used.

The TDV LCC method may provide different compliance outcomes when compared to the annual present value LCC method. A measure that is more effective in reducing peak demand would get more favorable treatment with TDV. Gas saving measures, on the other hand, will likely result in similar outcomes using either the hourly or annual methods. Table 1 lists some of the measures that would likely be affected by TDV.

Table 1 – Likely Winners and Losers with the TDV LCC method

Winners	Losers	No Change
Peak Air Conditioning (SEER/EER issue)	Propane (smaller advantage over electricity)	Insulation
Fenestration (more directional)	Economizers	Residential Water Heating
Gas Cooling	Other Off-Peak	
Cool Roofs		
Other On-Peak		

The following sections describe the annual and hourly LCC methods. Please be advised that the CEC forecasting group is in the process of revising some of the values to be used in the analysis. While present value data may change, the fundamental method will remain unchanged.

Annual LCC Method

Basic Methodology

The key points of the annual LCC methodology are as follows:

1. If a measure reduces overall life cycle cost, then it is cost effective. It is not necessary (or even desirable) to calculate absolute life cycle cost.

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[1]   Warren Alquist Act, Section 25402.

[2]   For example, this approach was used for the 2001 (AB 970) standards and the 1992 standards. No significant life-cycle cost work was performed in conjunction with the 1995 or 1998 updates.

2. The change in life cycle cost between two measures is calculated as follows:

| Change in Life cycle Cost | = | Change in Initial Cost | − | Present Value of Electricity Cost Savings | − | Present Value of Gas Cost Savings |

3. The present value of electricity and gas cost savings is calculated as follows:

Present Value of Energy Cost Savings	=	Energy Saved Per Year	X	Present value per unit of energy saved over the life of the measure		
($)		(kWh/y)		($/(kWh/y))		Electricity units
($)		(therms)		($/therm)		Gas units

Economic Assumptions

1. Future energy savings are discounted to present value at the rate of 3%. The discount rate is used to devalue energy savings in the future. The 3% rate is a real rate, with no consideration of inflation and is unchanged from previous Energy Commission life cycle cost analysis. This value was used with the AB 970 and 1992 standards for both the residential and nonresidential standards.

2. For nonresidential lighting and HVAC measures, energy savings are considered over a period of 15 years. This is consistent with assumptions used in 1992. However, with AB 970 nonresidential building envelope measures, energy savings are considered over a period of 30 years. A shorter 15-life is assumed for HVAC and lighting measures in nonresidential buildings..

3. A 30-year time horizon is used for all low-rise residential measures.

4. Price projections for electricity and natural gas are taken from the CEC forecasting group.

Present Value of Electricity and Natural Gas

Table 2 summarizes the 15-year and 30-year net present value of gas and electricity for residential and nonresidential buildings. These estimates are based on a 3% discount rate. The 30-year values should be used for all residential analysis. The medium commercial values should be used for nonresidential buildings. The 30-year time horizon should be used for building envelop measures and the 15-year time horizon for lighting, water heating and HVAC measures.

Table 2 – Net Present Value of Gas and Electricity for various sectors

Time Horizon	Electricity ($/kWh-y)		Natural Gas ($/therms-y)	
	Residential	Nonresidential	Residential	Commercial
30 Years	2.06	2.10	14.21	12.64
15 Years	N.A.	1.37	N.A.	7.30

Note: The medium commercial rate applies to buildings that will demand greater than 20 kW. The vast majority of nonresidential buildings fit into this medium commercial category

Comparison of Annual LCC Present Value Savings

Table 3 compares the net present value of electricity and gas savings based on the methods described above. The CEC statewide averages should be used in the analysis and these values are generally conservative, e.g. using any of the other assumptions would justify a greater level of stringency.

Table 3 – Range of Present Value Estimates for Electricity and Gas Costs

Estimate	Time Horizon	Present Value of a kWh of Electricity Saved Over the Building Life			Present Value of a Therm of Gas Saved Over the Building Life	
		Residential	Small	Medium	Residential	Nonresidential
Current CEC Statewide Averages	15 Years	N.A>	N.A	$1.37	$8.32	$7.30
	30 Years	$2.06	N.A.	$2.10	$14.21	$12.64
1992 Standards	15 Years	N. A[gwp1].	$1.04		N. A.	$6.47
	30 Years	$1.95	N. A.	N. A.	$14.08	N. A.
AB 970 Standards	15 Years	1.27	$1.31	$1.02	$8.20	$7.04
	30 Years	2.07	$2.15	$1.68	$13.27	$11.43
AB 970 CEC Time Block Weighted[gwp2]	15 Years	N. A.	$1.35	$1.03	N. A.	N. A.
	30 Years	N. A.	$2.17	$1.66	N. A.	N. A.
AB 970 CPUC Time Block Weighted[gwp3]	15 Years	N. A.	$1.79	$1.59	N. A.	N. A.
	30 Years	N. A.	$2.74	$2.39	N. A.	N. A.
ASHRAE/IESNA Standard 90.1-1999	15 Years	N. A.	$0.64		N. A.	$4.48
	30 Years	N. A.			N. A.	
PG&E Time Dependent Valuation (TDV[gwp4])	15 Years	N. A.	≈ $1.35		N. A.	$8.60
	30 Years	$2.50	N. A.	N. A.	$18.60	N. A.

Note: Life cycle cost for the 2001 (AB 970) changes were based on statewide averages. Values used are shown bold faced.

Hourly LCC Method

Time Dependent Valuation (TDV) is a proposal to account for time-of-use in determining compliance with the Standards and for showing that requirements are cost effective. In its most fundamental presentation, TDV is based on a time series of hourly present values for electricity, natural gas and propane[3]. Values have been developed for both residential and nonresidential buildings and for all 16 climate zones. In all, the data set consists of 96 time series (16 climates times 2 building types times 3 energy types) and each time series has 8,760 hours of data. All data is available at www.h-m-g.com/TDV/index.htm. The present value numbers for nonresidential buildings are based on 15-year projections [CE5]while the present value numbers for low-rise residential buildings are based on 30-year projections.

Table 4 is a statistical summary of the data showing the average present value figure, the minimum, maximum and standard deviation for each of the 96 cases. The following are a few highlights from this table.

▪ The simple average TDV present value of a kWh of electricity for nonresidential buildings is between $1.26 and $1.42, but hourly variations are as low as $0.66 and as high as $7.04. This is based on a 15 year time period and a 3% discount rate.

▪ For natural gas, the nonresidential TDV present value is between $7.05/therm and $8.20/therm. For natural gas the variation is mostly seasonal with little variation by time-of-day, unlike electricity.

▪ For residences, the average TDV present value for a kWh of electricity savings in residential buildings ranges from $1.82 to $2.04 with hourly variations as low as $0.89/kWh and as high as $12.19/kWh.

▪ Natural gas present values for residences are between $13.74/therm and $15.22/therm. Like nonresidential buildings, the variation is small and mostly seasonal. The variation for propane is also small and mostly seasonal.

▪ Propane is similar to natural gas, in that the variation is small and the changes are mostly seasonal.

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[3]   A separate analysis of propane has not been performed in previous life cycle cost work supporting the Standards.

The hourly LCC method is similar to the annual LCC method, except that energy savings are calculated on an hourly basis and the NPV of energy savings is calculated by multiplying the savings for each hour times the NPV for that hour.

Table 4 – Statistical Summary of TDV Present Values

		Electricity ($/kWh)		Gas ($/therm)		Propane ($/therm)	
		Commercial	Residential	Commercial	Residential	Commercial	Residential
CZ1	Average	$1.26	$1.83	$8.04	$13.74	$13.65	$25.00
	Minimum	$0.66	$0.98	$7.38	$12.61	$12.30	$22.70
	Maximum	$5.05	$7.61	$8.88	$15.17	$14.79	$26.92
	Stand. Dev.	$0.42	$0.63	$0.42	$0.72	$0.84	$1.42
CZ2	Average	$1.26	$1.83	$8.04	$13.74	$13.65	$25.00
	Minimum	$0.66	$0.98	$7.38	$12.61	$12.30	$22.70
	Maximum	$5.24	$7.94	$8.88	$15.17	$14.79	$26.92
	Stand. Dev.	$0.44	$0.67	$0.42	$0.72	$0.84	$1.42
CZ3	Average	$1.26	$1.84	$8.04	$13.74	$13.65	$25.00
	Minimum	$0.66	$0.99	$7.38	$12.61	$12.30	$22.70
	Maximum	$5.74	$8.92	$8.88	$15.17	$14.79	$26.92
	Stand. Dev.	$0.45	$0.69	$0.42	$0.72	$0.84	$1.42
CZ4	Average	$1.26	$1.83	$8.04	$13.74	$13.65	$25.00
	Minimum	$0.66	$0.99	$7.38	$12.61	$12.30	$22.70
	Maximum	$7.83	$12.19	$8.88	$15.17	$14.79	$26.92
	Stand. Dev.	$0.50	$0.77	$0.42	$0.72	$0.84	$1.42
CZ5	Average	$1.26	$1.84	$8.04	$13.74	$13.65	$25.00
	Minimum	$0.66	$0.99	$7.38	$12.61	$12.30	$22.70
	Maximum	$6.49	$10.23	$8.88	$15.17	$14.79	$26.92
	Stand. Dev.	$0.47	$0.73	$0.42	$0.72	$0.84	$1.42
CZ6	Average	$1.42	$2.02	$7.05	$15.22	$13.65	$25.00
	Minimum	$0.67	$0.90	$6.53	$14.11	$12.30	$22.70
	Maximum	$4.95	$7.53	$7.77	$16.78	$14.79	$26.92
	Stand. Dev.	$0.47	$0.72	$0.41	$0.89	$0.84	$1.42
CZ7	Average	$1.30	$2.04	$8.20	$15.36	$13.65	$25.00
	Minimum	$0.66	$1.10	$7.01	$13.12	$12.30	$22.70
	Maximum	$4.74	$7.32	$9.07	$16.98	$14.79	$26.92
	Stand. Dev.	$0.44	$0.66	$0.57	$1.07	$0.84	$1.42
CZ8	Average	$1.42	$2.01	$7.05	$15.22	$13.65	$25.00
	Minimum	$0.67	$0.89	$6.53	$14.11	$12.30	$22.70
	Maximum	$6.00	$9.17	$7.77	$16.78	$14.79	$26.92
	Stand. Dev.	$0.51	$0.79	$0.41	$0.89	$0.84	$1.42

Table 4 – Statistical Summary of TDV Present Values (continued)

		Electricity ($/kWh)		Gas ($/therm)		Propane ($/therm)	
		Commercial	Residential	Commercial	Residential	Commercial	Residential
CZ9	Average	$1.42	$2.00	$7.05	$15.22	$13.65	$25.00
	Minimum	$0.67	$0.88	$6.53	$14.11	$12.30	$22.70
	Maximum	$7.04	$10.96	$7.77	$16.78	$14.79	$26.92
	Stand. Dev.	$0.55	$0.86	$0.41	$0.89	$0.84	$1.42
CZ10	Average	$1.42	$2.00	$7.05	$15.22	$13.65	$25.00
	Minimum	$0.67	$0.88	$6.53	$14.11	$12.30	$22.70
	Maximum	$5.99	$9.11	$7.77	$16.78	$14.79	$26.92
	Stand. Dev.	$0.51	$0.79	$0.41	$0.89	$0.84	$1.42
CZ11	Average	$1.26	$1.82	$8.04	$13.74	$13.65	$25.00
	Minimum	$0.66	$0.98	$7.38	$12.61	$12.30	$22.70
	Maximum	$4.83	$7.25	$8.88	$15.17	$14.79	$26.92
	Stand. Dev.	$0.43	$0.65	$0.42	$0.72	$0.84	$1.42
CZ12	Average	$1.26	$1.83	$8.04	$13.74	$13.65	$25.00
	Minimum	$0.66	$0.98	$7.38	$12.61	$12.30	$22.70
	Maximum	$6.18	$9.46	$8.88	$15.17	$14.79	$26.92
	Stand. Dev.	$0.47	$0.72	$0.42	$0.72	$0.84	$1.42
CZ13	Average	$1.26	$1.82	$8.04	$13.74	$13.65	$25.00
	Minimum	$0.66	$0.97	$7.38	$12.61	$12.30	$22.70
	Maximum	$4.66	$6.97	$8.88	$15.17	$14.79	$26.92
	Stand. Dev.	$0.41	$0.62	$0.42	$0.72	$0.84	$1.42
CZ14	Average	$1.42	$2.00	$7.05	$15.22	$13.65	$25.00
	Minimum	$0.67	$0.88	$6.53	$14.11	$12.30	$22.70
	Maximum	$5.41	$8.16	$7.77	$16.78	$14.79	$26.92
	Stand. Dev.	$0.49	$0.75	$0.41	$0.89	$0.84	$1.42
CZ15	Average	$1.42	$1.99	$7.05	$15.22	$13.65	$25.00
	Minimum	$0.67	$0.87	$6.53	$14.11	$12.30	$22.70
	Maximum	$5.51	$8.31	$7.77	$16.78	$14.79	$26.92
	Stand. Dev.	$0.49	$0.76	$0.41	$0.89	$0.84	$1.42
CZ16	Average	$1.26	$1.83	$8.04	$13.74	$13.65	$25.00
	Minimum	$0.66	$0.98	$7.38	$12.61	$12.30	$22.70
	Maximum	$5.31	$8.03	$8.88	$15.17	$14.79	$26.92
	Stand. Dev.	$0.43	$0.64	$0.42	$0.72	$0.84	$1.42

Appendices

This section of the life-cycle cost report summarizes detail from the AB 970 work conducted in the fourth quarter of 2000.

AB 970 Statewide Projections

As part of the research leading up to the AB 970 standards changes, the Energy Commission made estimates of the statewide average cost of electricity and gas for different classes of residential and nonresidential customers. The CEC estimates extend for a period of 20 years. Price projections for subsequent years were estimated through a linear extrapolation of the change in price over the preceding ten years. These data (see Table 5) are the basis of the present values shown in Table 2.

Table 5 – AB 970 Statewide Average Electricity and Gas Price Projections

Year	Electricity ($/kWh)			Natural Gas ($/therms)	
	Residential	Small Commercial	Medium Commercial	Residential	Commercial
2000	0.11	0.12	0.10	0.90	0.81
2001	0.11	0.11	0.09	0.82	0.72
2002	0.11	0.11	0.08	0.70	0.60
2003	0.10	0.10	0.08	0.62	0.52
2004	0.10	0.10	0.08	0.62	0.52
2005	0.10	0.10	0.08	0.61	0.52
2006	0.10	0.11	0.08	0.62	0.53
2007	0.10	0.10	0.08	0.62	0.53
2008	0.10	0.10	0.08	0.62	0.53
2009	0.10	0.10	0.08	0.63	0.53
2010	0.10	0.10	0.08	0.62	0.53
2011	0.10	0.10	0.08	0.62	0.53
2012	0.10	0.10	0.08	0.63	0.54
2013	0.10	0.10	0.08	0.63	0.54
2014	0.10	0.11	0.08	0.63	0.54
2015	0.10	0.11	0.08	0.63	0.54
2016	0.10	0.11	0.08	0.63	0.54
2017	0.10	0.11	0.08	0.64	0.55
2018	0.10	0.11	0.08	0.64	0.55
2019	0.10	0.11	0.08	0.64	0.55
2020	0.10	0.11	0.08	0.64	0.55
2021	0.10	0.11	0.08	0.64	0.56
2022	0.10	0.11	0.08	0.64	0.56
2023	0.10	0.11	0.08	0.65	0.56
2024	0.10	0.11	0.08	0.65	0.56
2025	0.10	0.11	0.08	0.65	0.57
2026	0.10	0.11	0.08	0.65	0.57
2027	0.10	0.11	0.08	0.65	0.57
2028	0.10	0.11	0.08	0.65	0.57
2029	0.10	0.11	0.08	0.65	0.58
2030	0.11	0.12	0.10	0.90	0.81

AB 970 Time-of-use Price Projections

Another approach for assigning a value to future energy costs is to look at the energy costs during time blocks typical of the time-of-use rates used with large commercial buildings. Time-of-use rates for most nonresidential customers are based on time blocks similar to the ones defined in Table 6. These are the basis of the analysis in this report.

Table 6 – Definition of Time Blocks.

	On-Peak	Mid-Peak	Off-Peak
Summer (May 1 - October 31)	Noon to 6 pm during all non-holiday weekdays	9 AM to 9 PM during all non-holiday weekdays	9 PM to 9 AM during all non-holiday weekdays and 24 hours/day during weekends and holidays
Winter (November 1 – April 30)	Not Applicable	9 AM to 9 PM during all non-holiday weekdays	

Note: Winter on-peak was not considered here as it is rarely used by California utilities in their tariffs.

Appendix A contains 30-year electricity price projections from two sources: the CEC forecasting group and the California Public Utilities Commission (CPUC). Table 8 and Table 9 have the CEC projections for small and medium commercial buildings. Table 10 and Table 11 have the CPUC estimates for the same customer classes.

Table 7 summarizes the net present value of electricity in each time block based on a 3% discount rate. The last column shows the weighted average rate. This is based on the weightings shown in the first two rows of

the table. The weightings are calculated according to energy savings associated with the changes between the 1998 standard and the AB 970 Standards. More details of the analysis are described in *AB 970 Volume IV – Impact Analysis.*
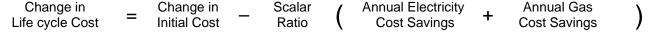
Table 7 – AB970 Average Net Present Value of Electricity for Various Time Blocks and Building Sectors

	Building Sector	NPV	Summer On-Peak	Summer Mid-Peak	Summer Off-Peak	Winter Mid-Peak	Winter Off-Peak	Weighted Average[CE6]
Weights	Small Commercial		13%	14%	14%	41%	18%	N.A.
	Medium Commercial		19%	16%	17%	32%	16%	N.A.
CEC Estimate	Residential[CE7][4]	30 Years[gwp8]	2.59	2.10	1.79	2.15	1.94	N.A.
	Small Commercial	30 Years	2.64	2.15	1.84	2.20	2.03	2.17
		15 Years	1.63	1.33	1.15	1.37	1.25	1.35
	Medium Commercial	30 Years	2.10	1.62	1.31	1.66	1.54	1.66
		15 Years	1.30	1.00	0.81	1.03	0.95	1.03
CPUC Estimate	Residential	30 Years	5.31	2.44	2.13	2.40	2.12	N.A.
	Small Commercial	30 Years	5.36	2.49	2.18	2.44	2.18	2.74
		15 Years	3.70	1.61	1.43	1.55	1.36	1.79
	Medium Commercial	30 Years	4.80	1.96	1.65	1.91	1.71	2.39
		15 Years	3.35	1.28	1.10	1.22	1.07	1.59

Notes: Weights for each time block are calculated based on the energy savings resulting from the AB 970 Standards in each time block using the NRNC database. Medium commercial is most of the nonresidential new construction, representing more than 99%. AB 970 NPV calculations are based on price projections in Table 8, Table 9, Table 10, and Table 11.

LCC Analysis Justifying ASHRAE/IESNA Standard 90.1-1999

Some of the proposed standards changes are based on requirements contained in ASHRAE/IESNA Standard 90.1-1999. Most of the requirements in ASHRAE 1999 were justified with life cycle cost analysis. The ASHRAE approach to life cycle cost is simple. It is based on the concept of a scalar ratio. The scalar ratio accounts for the discount rate, study period (building life), and other factors. The following equation shows how life cycle cost was calculated by the ASHRAE committee.

$$\text{Change in Life cycle Cost} = \text{Change in Initial Cost} - \text{Scalar Ratio} \left(\text{Annual Electricity Cost Savings} + \text{Annual Gas Cost Savings} \right)$$

The scalar ratio combines the effects of equipment life, discount rate, fuel escalation rates, federal and state tax rates, down payment, and financing costs. The scalar ratio is applied to the annual energy costs for each measure in a fashion similar to a series present worth factor. Annual energy costs are determined using the estimated annual energy use for a measure and national average energy prices of \$0.08/kWh for electricity and \$0.56/therm for natural gas. Because the analysis considered incremental changes in measure efficiency, maintenance costs for each incremental change were assumed to be zero.

ASHRAE used a scalar ratio of 8 for the development of all criteria. Using the ASHRAE scalar ratio and national average energy prices, the effective present worth of a kWh of electricity saved over the life of the building is approximately \$0.64/kWh-y, while the effective present worth of a therm of gas saved over the life of the building is \$4.48/therm-y.

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[4]   A summary of the residential data can be found in the Residential AB 970 Contractor Report, Volume 3 at http://www.energy.ca.gov/reports/2001-03-01_400-00-023-V3.PDF.

AB 970 TOU Electricity Price Projections

Table 8 [gwp9]*– AB 970 CEC Electricity Price Projections for Various Time Blocks – Small Commercial ($/kWh)*

Year	Summer On-Peak	Summer Mid-Peak	Summer Off-Peak	Winter On-Peak	Winter Mid-Peak	Winter Off-Peak
2001	0.146	0.122	0.102	0.136	0.128	0.111
2002	0.151	0.120	0.103	0.132	0.126	0.110
2003	0.141	0.117	0.100	0.126	0.120	0.104
2004	0.134	0.107	0.097	0.120	0.114	0.100
2005	0.133	0.110	0.096	0.119	0.113	0.100
2006	0.132	0.110	0.095	0.117	0.111	0.100
2007	0.132	0.109	0.095	0.117	0.111	0.101
2008	0.125	0.102	0.087	0.110	0.103	0.096
2009	0.125	0.102	0.087	0.110	0.103	0.098
2010	0.126	0.102	0.087	0.110	0.104	0.099
2011	0.126	0.103	0.087	0.111	0.104	0.099
2012	0.127	0.103	0.088	0.111	0.104	0.099
2013	0.127	0.103	0.088	0.111	0.105	0.099
2014	0.128	0.103	0.088	0.112	0.105	0.100
2015	0.128	0.104	0.088	0.112	0.105	0.100
2016	0.129	0.104	0.088	0.112	0.106	0.100
2017	0.129	0.104	0.088	0.113	0.106	0.100
2018	0.130	0.105	0.089	0.113	0.106	0.100
2019	0.130	0.105	0.089	0.114	0.107	0.100
2020	0.131	0.105	0.089	0.114	0.107	0.101
2021	0.130	0.105	0.089	0.113	0.106	0.100
2022	0.128	0.104	0.088	0.112	0.105	0.100
2023	0.127	0.103	0.088	0.111	0.105	0.099
2024	0.126	0.102	0.087	0.111	0.104	0.099
2025	0.125	0.102	0.087	0.110	0.103	0.098
2026	0.124	0.101	0.086	0.109	0.103	0.098
2027	0.124	0.101	0.086	0.109	0.103	0.098
2028	0.123	0.101	0.086	0.109	0.102	0.098
2029	0.123	0.100	0.086	0.108	0.102	0.098
2030	0.122	0.100	0.085	0.108	0.101	0.098

Table 9 – AB 970 CEC Electricity Price Projections for Various Time Blocks – Medium Commercial ($/kWh)

Year	Summer On-Peak	Summer Mid-Peak	Summer Off-Peak	Winter On-Peak	Winter Mid-Peak	Winter Off-Peak
2001	0.126	0.100	0.079	0.116	0.107	0.091
2002	0.116	0.086	0.069	0.098	0.092	0.081
2003	0.108	0.083	0.067	0.093	0.087	0.077
2004	0.101	0.074	0.064	0.087	0.082	0.073
2005	0.101	0.079	0.064	0.087	0.082	0.073
2006	0.101	0.079	0.064	0.086	0.080	0.073
2007	0.102	0.079	0.065	0.087	0.081	0.074
2008	0.101	0.079	0.064	0.086	0.080	0.075
2009	0.102	0.079	0.064	0.087	0.080	0.076
2010	0.102	0.079	0.064	0.087	0.080	0.076
2011	0.103	0.079	0.065	0.087	0.081	0.077
2012	0.103	0.080	0.065	0.088	0.081	0.077
2013	0.102	0.079	0.063	0.087	0.080	0.076
2014	0.103	0.079	0.064	0.087	0.080	0.076
2015	0.103	0.079	0.064	0.087	0.081	0.076
2016	0.104	0.079	0.064	0.088	0.081	0.076
2017	0.104	0.080	0.064	0.088	0.081	0.077
2018	0.105	0.080	0.064	0.089	0.082	0.077
2019	0.105	0.080	0.064	0.089	0.082	0.077
2020	0.106	0.081	0.065	0.089	0.082	0.077
2021	0.105	0.080	0.064	0.088	0.081	0.077
2022	0.103	0.079	0.064	0.087	0.081	0.076
2023	0.102	0.078	0.063	0.087	0.080	0.076
2024	0.101	0.078	0.062	0.086	0.079	0.075
2025	0.099	0.077	0.062	0.085	0.078	0.075
2026	0.099	0.076	0.062	0.084	0.078	0.074
2027	0.098	0.076	0.061	0.084	0.078	0.074
2028	0.098	0.076	0.061	0.084	0.077	0.074
2029	0.097	0.075	0.061	0.083	0.077	0.074
2030	0.096	0.075	0.061	0.082	0.076	0.073

Table 10 – AB 970CPUC Adjusted Electricity Price Projections for Various Time Blocks –Small Commercial ($/kWh)

Year	Summer On-Peak	Summer Mid-Peak	Summer Off-Peak	Winter On-Peak	Winter Mid-Peak	Winter Off-Peak
2001	0.327	0.172	0.167	0.146	0.130	0.110
2002	0.364	0.190	0.184	0.160	0.142	0.117
2003	0.346	0.137	0.117	0.148	0.141	0.118
2004	0.330	0.125	0.113	0.141	0.135	0.113
2005	0.326	0.130	0.112	0.139	0.133	0.112
2006	0.298	0.129	0.112	0.137	0.131	0.112
2007	0.299	0.128	0.111	0.137	0.130	0.113
2008	0.291	0.121	0.103	0.129	0.122	0.109
2009	0.290	0.121	0.103	0.129	0.123	0.110
2010	0.288	0.121	0.103	0.129	0.123	0.111
2011	0.259	0.112	0.097	0.119	0.113	0.106
2012	0.259	0.112	0.097	0.119	0.113	0.106
2013	0.259	0.112	0.096	0.119	0.113	0.106
2014	0.258	0.112	0.096	0.119	0.113	0.106
2015	0.255	0.112	0.096	0.119	0.114	0.106
2016	0.252	0.112	0.096	0.119	0.113	0.106
2017	0.247	0.112	0.096	0.120	0.114	0.106
2018	0.241	0.112	0.096	0.120	0.114	0.106
2019	0.235	0.112	0.096	0.120	0.114	0.106
2020	0.228	0.112	0.096	0.120	0.114	0.106
2021	0.220	0.112	0.095	0.120	0.113	0.105
2022	0.213	0.111	0.095	0.119	0.113	0.105
2023	0.206	0.111	0.095	0.119	0.113	0.104
2024	0.200	0.111	0.095	0.119	0.113	0.104
2025	0.193	0.111	0.094	0.119	0.112	0.103
2026	0.187	0.110	0.094	0.118	0.112	0.103
2027	0.181	0.110	0.094	0.118	0.112	0.103
2028	0.174	0.110	0.094	0.118	0.112	0.102
2029	0.167	0.110	0.093	0.118	0.112	0.102
2030	0.161	0.110	0.093	0.118	0.112	0.102

Table 11 – AB 970 CPUC Electricity Price Projections for Various Time Blocks – Medium Commercial ($/kWh)

Year	Summer On-Peak	Summer Mid-Peak	Summer Off-Peak	Winter On-Peak	Winter Mid-Peak	Winter Off-Peak
2001	0.320	0.154	0.149	0.126	0.109	0.091
2002	0.326	0.154	0.149	0.125	0.107	0.089
2003	0.310	0.104	0.084	0.114	0.108	0.092
2004	0.295	0.093	0.081	0.108	0.102	0.087
2005	0.292	0.098	0.081	0.108	0.102	0.087
2006	0.265	0.098	0.081	0.106	0.100	0.087
2007	0.266	0.098	0.081	0.106	0.100	0.088
2008	0.266	0.097	0.080	0.106	0.099	0.088
2009	0.265	0.097	0.080	0.106	0.099	0.089
2010	0.263	0.097	0.080	0.106	0.099	0.090
2011	0.234	0.089	0.074	0.096	0.090	0.084
2012	0.234	0.088	0.073	0.096	0.090	0.084
2013	0.233	0.087	0.072	0.094	0.089	0.083
2014	0.231	0.087	0.072	0.095	0.089	0.083
2015	0.229	0.087	0.072	0.095	0.089	0.083
2016	0.225	0.087	0.071	0.095	0.089	0.083
2017	0.220	0.087	0.071	0.095	0.089	0.083
2018	0.215	0.087	0.071	0.095	0.089	0.083
2019	0.208	0.087	0.071	0.095	0.089	0.083
2020	0.202	0.087	0.071	0.095	0.089	0.083
2021	0.194	0.087	0.071	0.095	0.089	0.082
2022	0.186	0.086	0.070	0.094	0.088	0.082
2023	0.179	0.086	0.070	0.094	0.088	0.081
2024	0.173	0.086	0.070	0.094	0.088	0.080
2025	0.166	0.086	0.069	0.093	0.087	0.080
2026	0.160	0.085	0.069	0.093	0.087	0.080
2027	0.154	0.085	0.069	0.093	0.087	0.079
2028	0.147	0.085	0.069	0.093	0.087	0.079
2029	0.140	0.085	0.069	0.093	0.087	0.078
2030	0.133	0.085	0.068	0.093	0.086	0.078